

CLAIMS

1. A tactile generator comprising:
 - an electric motor;
 - an eccentric mass rotated by the motor about a rotational axis to produce vibration, the mass being radially movable to vary a distance between the mass and the axis; and
 - wherein varying the distance of the mass from the axis varies the amount of vibration generated when the mass is rotated.
2. The tactile generator of claim 1 wherein upon rotation of the mass, the distance of the mass from the axis is dependent on the rotational speed of the mass.
3. The tactile generator of claim 1 wherein the electric motor rotates the mass via an output shaft interconnecting the mass and the electric motor.
4. The tactile generator of claim 3 further comprising a biasing member to urge the mass towards the axis.
5. The tactile generator of claim 4 wherein the biasing member comprises a spring.
6. The tactile generator of claim 4 wherein the biasing member comprises a magnet.
7. The tactile generator of claim 4 wherein the biasing member comprises an electromagnet.

8. The tactile generator of claim 4 further comprising an extension including a mechanical stop, the extension being attached at one end to the shaft.
9. The tactile generator of claim 8 wherein the biasing member is disposed on the extension between the mechanical stop and the mass.
10. The tactile generator of claim 8 wherein the biasing member is disposed on the shaft.
11. The tactile generator of claim 1 wherein a controller controls the vibration produced by the mass by controlling the distance of the mass from the axis.
12. The tactile generator of claim 11 wherein the controller varies a speed of the electric motor.
13. The tactile generator of claim 11 wherein the controller varies the strength of a magnetic field of an electromagnet.
14. The tactile generator of claim 11 wherein the controller varies the distance between the mass and the axis responsive to ambient noise levels.
15. The tactile generator of claim 11 wherein the controller maintains a desired rotational speed of the mass.
16. The tactile generator of claim 1 wherein the vibration produced by the rotating mass varies proportionally to the distance of the mass from the axis.

17. A wireless communications device comprising:

 a transceiver coupled to an antenna to communicate with a remote party;
 a controller to generate control signals responsive to a detected ambient noise
 level; and
 a tactile generator responsive to the control signals, the tactile generator
 comprising:
 an electric motor;
 an eccentric mass rotated by the motor about a rotational axis to produce
 vibration, the mass being radially movable to vary a distance between
 the mass and the axis; and
 wherein varying the distance of the mass from the axis varies the amount
 of vibration generated when the mass is rotated.

18. The wireless communications device of claim 17 wherein upon rotation of the mass,
the distance of the mass from the axis is dependent on the rotational speed of the mass.

19. The wireless communications device of claim 17 further comprising an output shaft
rotated about the axis by the electric motor.

20. The wireless communications device of claim 19 wherein the rotating output shaft
rotates the mass about the axis.

21. The wireless communications device of claim 17 further comprising a biasing
member to urge the mass towards the axis.

22. The wireless communications device of claim 21 wherein the biasing member comprises a spring.
23. The wireless communications device of claim 21 wherein the biasing member comprises a magnet.
24. The wireless communications device of claim 21 wherein the biasing member comprises an electromagnet.
25. The wireless communications device of claim 17 wherein the controller varies the radial distance of the mass from the axis responsive to the detected ambient noise level.
26. The wireless communications device of claim 25 further comprising a microphone to detect the ambient noise level.
27. The wireless communications device of claim 25 wherein the controller varies the speed of the electric motor.
28. The wireless communications device of claim 25 wherein the controller varies the strength of a magnetic field of an electromagnetic magnet.
29. The wireless communications device of claim 25 wherein the controller maintains the rotational speed of the mass.
30. The wireless communications device of claim 17 wherein the wireless communications device comprises a cellular telephone.

31. The wireless communications device of claim 17 wherein the vibration produced by the rotating mass varies proportionally to the distance of the center of mass from the axis.

32. A method of providing tactile functions in a wireless communications device comprising:
 - rotating an eccentric mass about a rotational axis to impart a vibration to the wireless communications device; and
 - varying a radial distance of the mass from the axis to vary the amount of vibration generated when the mass is rotated.
33. The method of claim 32 wherein the vibration produced by the rotating mass is dependent on the rotational speed of the mass.
34. The method of claim 32 wherein rotating an eccentric mass about a rotational axis comprises rotating an output shaft with an electric motor.
35. The method of claim 32 further comprising biasing the mass towards the axis.
36. The method of claim 32 further comprising measuring the ambient noise level.
37. The method of claim 36 further comprising generating a control signal indicative of the measured ambient noise level.
38. The method of claim 37 wherein varying a radial distance of the mass from the axis comprises varying the radial distance responsive to the control signal.
39. The method of claim 32 wherein varying a radial distance of the mass from the axis comprises controlling the speed of the electric motor.

40. The method of claim 39 wherein controlling the speed of the electric motor comprises controlling the speed of the electric motor to impart a rotational force to the shaft in discrete levels.
41. The method of claim 39 wherein controlling the speed of the electric motor comprises controlling the speed of the motor to maintain a desired rotational speed of the mass.
42. The method of claim 32 wherein varying a radial distance of the mass from the axis comprises controlling a strength of an electromagnet surrounding the mass.
43. The method of claim 32 wherein the vibration produced by the rotating mass is proportional to the distance of the mass from the axis.

44. A tactile generator comprising:

an eccentric mass rotated about a rotational axis, the mass being radially movable to vary a distance between the mass and the axis; and wherein varying the distance of between the mass and the axis varies the amount of vibration generated when the mass is rotated.

45. The tactile generator of claim 44 wherein the distance of the mass from the axis is dependent on the rotational speed of the mass.

46. The tactile generator of claim 44 further comprising an electric motor having an output shaft to rotate the mass.

47. The tactile generator of claim 44 further comprising a biasing member to urge the mass towards the axis

48. The tactile generator of claim 44 wherein the radial distance of the mass from the axis is controlled responsive to ambient noise levels.